



Contribution ID: 1730 Contribution code: THPA167

Type: **Poster Presentation**

Design and production of the fast HESR-injection kicker magnets

Thursday, 11 May 2023 16:30 (2 hours)

The High Energy Storage Ring (HESR) has been designed for acceleration and storage of antiprotons and ions by Forschungszentrum Jülich (FZ-Jülich) for FAIR in Darmstadt.

The HESR kicker magnets have been designed for the injection of charged particles with magnetic rigidity of 13 Tm. Kicker magnets shall generate a total integral field of 57.8 mT during 500 ns with rise- and fall-times of less than 220 ns. To produce the necessary injection field, a current pulse of up to 4000A/70 kV has to be sent through the magnets. Since the injection process using longitudinal stacking should not destroy the stored beam, special attention has been paid to the flatness of the current pulse at flat-top ($(I-I_0)/I_0 < 0.08$) and to the current variation after ramp down (< 10 A).

All the challenges of the kicker design have been successfully solved and the kicker system of the HESR has been produced. The system consists of four kicker magnets in two UHV tanks and one solid-state pulser with control system for every magnet. The pulsers, connected with magnet using a coaxial cable in Blumlein topology, are made of commercially available semiconductor based switches. Using a special tuning procedure the designed requirements for the pulse shape have been successfully met. Main details of the designed system, achieved parameters and solutions used in the produced injection kicker system will be presented in this contribution.

Funding Agency

Footnotes

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Session Classification: Thursday Poster Session

Track Classification: MC7: Accelerator Technology and Sustainability: MC7.T16: Pulsed Power Technology